Service manual

TM200

Rev. No. : V. 1.10
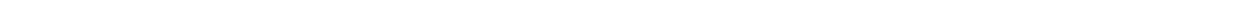
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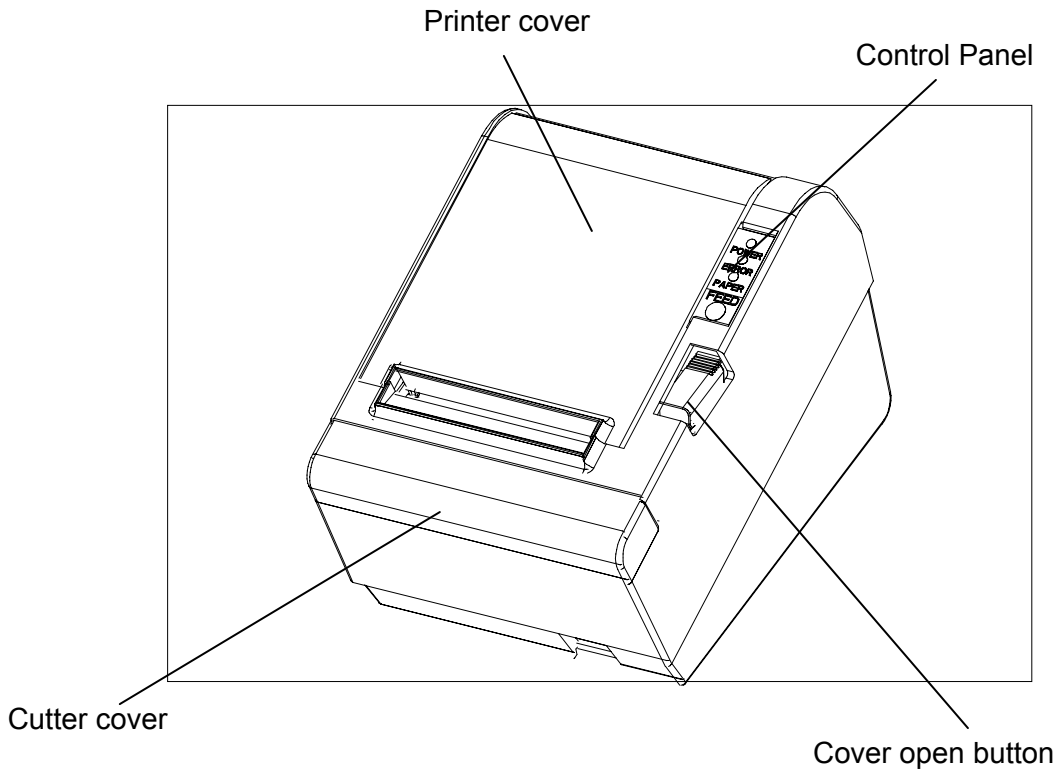
Figure 1-1 TM200 appearance

Printing Specifications

Printing method:	Thermal line printing
Dot density:	203 dpi x 203 dpi (8 dot/mm)
Printing direction:	Unidirectional with friction feed
Printing width:	72mm (2.83"), 576 dot positions
Characters per line (default):	48 (Font A) 64 (Font B)
Character spacing (default):	0.28 mm (0.1") (2 dots) (Font A) 0.28mm (.01") (2 dots) (Font B) Programmable by control command.
Printing speed	180 mm / sec (approxi. 7.1" / sec) 60 lines / sec (computed value for 3.18mm (1/8") feed) 28.4 lines / sec maximum (4.23 mm (1/6") feed, at 24V, 28 ◦ C (82 ◦ F), density level 2)
Paper feeding speed:	Approximately 180 mm / sec (7.0"/sec) continuous paper feeding
Receive Buffer Size	96K Bytes
Number of characters:	Alphanumeric characters: 95 International characters: 32 Extended graphics: 128x7pages (including one space page) Traditional/ Simplified Chinese, Japanese, Kanji characters
Character structure:	Font A: 12 x 24 (including 2-dot spacing horizontally) Font B: 9 x 17 (including 2-dot spacing horizontally) Kanji: 24 x 24 Default font: Font A

***Notes**:*

Printing speed may be slower depending on the data transmission speed and the combination of control commands.

There may be variations in printing speed. To prevent this for logo printing, using a downloaded bit image is recommended.

Low transmission speed may cause intermittent printing. It is recommended to transmit data to the printer as quickly as possible.

Character size:

	Standard		Double-height		Double-width		Double-weight/ Double-height	
	W x H (mm)	CPL	W x H (mm)	CPL	W x H (mm)	CPL	W x H (mm)	CPL
Font A 12 x 24	1.23 x 2.97 (.05" x .11")	48	1.23 x 5.92 (.05" x .24")	48	2.47 x 2.97 (.10" x .11")	24	2.47 x5.92 (.10" x .24")	24
B 9 x 17	0.87 x 2.10 (.035" x .08")	64	0.87 x 4.20 (.035" x .17")	64	1.73 x 2.10 (.07" x .08")	32	1.73 x 4.20 (.07" x .17")	32
Kanji 24 x 24	2.97 x 2.97 (.11" x .11")	24	2.97 x 5.92 (.11" x .24")	24	5.92 x 2.97 (.24" x .11")	12	5.92 x 5.92 (.24" x .24")	12

* CPL = Characters Per Line
* Space between characters is not included
* Characters can be scaled up to 64 times as large as the standard sizes.

Autocutter

Partial cut: Cutting with one point center uncut
  (selectable by ESC I or **GS V**)

Full cut: Cutting without uncut (selectable by ESC i)

Note:
To prevent dot displacement, after cutting, paper must be fed approximately 1 mm (14/360 or 0.04 inch) or more before printing.

Paper Specifications

Paper type: Specified thermal roll paper

Form: Paper roll

Paper width: 79.5 ±0.5 mm (3.13" ± 0.02")

Paper roll size:

Roll diameter: Maximum 83 mm (3.27")

Take-up paper roll width: 80 + 0.5 / -1.0 mm

Paper roll diameter: Inside: 12 mm (0.47")

                                                 Outside: 18 mm (0.71")

CAUTION:
Paper must not be pasted to the paper roll.

Printable Area

Paper roll   The printable area of a paper with width of 79.5 ± 0.5 mm (3.13" ± 0.02") is 72.2 ± 0.2 mm (2.84" ± 0.008") (576 dots)

Internal Buffer

Receive buffer selectable as 2KB or 96KB using the DIP switch.

Non-volatile bit image buffer: 128KB

Electrical Specifications

Supply voltage: +24 VDC $\pm$ 7% **Current consumption (at 24V, normal temperature)**

High-speed mode: Mean: Approximately 1.8A
(Font A alphanumeric character printing for all columns)
Peak: Approximately 7.8A

Standby: Mean: Approximately 0.2A

Note :
Maximum 1A for drawer kick-out driving.

EMI and Safety Standards Applied

These standards are only valid for products which bear a mark or statement on the main unit.

Europe:	CE marking:	Directive: 89/336/EEC
		EN55022:1998 Class A
		EN6100-3-3:1995+A1:2001
		EN55024:1998, including
		IEC61000-4-2, IEC61000-4-3, IEC61000-4-4, IEC61000-4-5,
		IEC61000-4-6, IEC61000-4-8,
	Safety standards:	EN60950
North America:	EMI:	FCC Class A
	Safety standards:	UL1950/CSA C22.2 No.950
Oceania:	EMI:	AS/NZS3548

Conditions of acceptability

1. This component has been judged on the basis of the required spacing in the Standard for Information Technology Equipment, including Electrical Business Equipment, UL 1950 and CSA22.2 No. 950. sub-clause 2.9, which would cover the component itself if submitted for Listing.

2. The terminals and connectors have not been evaluated for field wiring.

Reliability

Life:	Mechanism:	15,000,000 lines
	Thermal head:	100 million pulses, 50 Km
	Autocutter:	1,200,000 cuts (End of life is defined to have been reached when it reaches the beginning of the wear out period.)
MTBF:		360,000 hours (Failure is defined as a random failure occurring during the time of the random failure period.)
MCBF:		52,000,000 lines (This is an average failure interval based on failures relating to wear out and random failures up to the life of 15 million lines.)

External Dimensions and Weight:

Height:	Approximately 138.7 mm (5.46")
Width:	Approximately 146.5 mm (5.77")
Depth:	Approximately 195 mm (7.68")
Weight:	Approximately 1.4 kg (3.08 lb) (except for the paper roll)

Environmental Conditions

Temperature:

Operating:	5 to 45℃ (41 to 113℉)
Storage:	−10 to 50℃ (14 to 122℉) (except for paper)

Humidity:

Operating:	10 to 90% RH
Storage:	10 to 90% RH (except for paper)

1.2 Major Component Specifications

TM200 Printer Mechanism

Paper Feed Motor
Type:	4-phase, 48-polarity, PM-type stepping motor
Drive voltage:	24 VDC ± 10%
Winding resistance:	11.5 ± 10% at 25° C (77° F), per phase

Print Head Unit
|	
Dot number:	576 dots
Dot density:	0.125 mm/dot (203 DPI)
Resistance:	Average 600 ± 4.6%

Paper-end Sensor	Reflection type photo sensor
Paper Roll Near-end Sensor	Reflection type photo sensor

Autocutter Unit
Type:	DC brush motor
Cutter motor voltage:	24 VDC ± 7%
Current consumption:	800 mA peak (at starting, low temperature) 70 mA average (room temperature)

1.3 Connectors

Interface   Drawer kick-out   Power supply
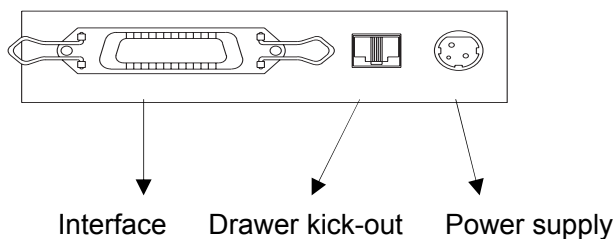
Power Supply Connector

This connector is used to connect the printer to an external power source.

Pin number	Signal name
1	+24 VDC
2	GND
3	NC
Shell	Frame GND

Figure 1-2 Power supply connector

Drawer Kick-out Connector

The pulse specified by **ESC p** is output to this connector. For the serial interface model, the host can confirm the status of the input signal by using the **DLE EOT**, **GS r**, or **GS a** (ASB) commands.

Drawer kick-out connector pin assignments

Pin Number	Signal Name	Direction
1	Frame GND	—
2	Drawer kick-out drive signal 1	Output
3	Drawer open/close signal	Input
4	+24 V	—
5	Drawer kick-out drive signal 2	Output
6	Signal GND	—

+24 V is always output through pin 4 during power on.

CAUTION:
Pin 4 must be used only for the drawer.

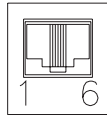Figure 1-3 Drawer kick-out connector

Drawer kick-out drive signal

Output signal: Output voltage: Approximately 24 V

                                           Output current: 1A or less

CAUTION:
To avoid an over current, the resistance of the drawer kick-out solenoid must be 24 or more.

1.4   Interfaces

RS-232 serial interface
Specifications:

Data transmission: Serial

Synchronization: Asynchronous

Handshaking: DTR/DSR or XON/XOFF control

Baud rate: 4800, 9600, 19200, 38400 bps

Data word length: 7 or 8 bits

Parity: None, even, odd

Stop bits: 1 or more

Connector (printer side):   Female DSUB-25 pin connector

Note:

The handshaking, data word length, baud rate, and parity depend on the DIP switch settings. Data transmitted from the printer has 1 stop bit (fixed)

Switching between online and offline

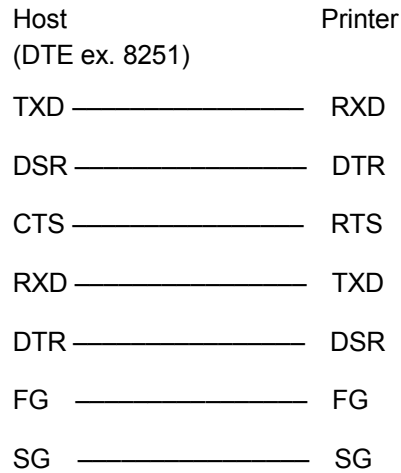The printer does not have an online/offline switch. The printer goes offline:

□ When the cover is open

□ When an error has occurred

□ When the printer stops printing due to a paper-end(in cases when an empty paper supply is detected by either paper roll end detector or the paper roll near- end detector with a printing halt feature using **ESC c 4)**

Interface connector terminal assignments and signal functions are described in the table below.

TM200 serial printer status and signals:

Pin number	Signal name	Signal direction	Function
1	FG	---	Frame ground
2	TXD	Output	Transmit data
3	RXD	Input	Receive data
4	RTS	Output	Same as DTR signal (Pin 20)
6	DSR	Input	This signal indicates whether the host computer can receive data.
			SPACE indicates that the host computer can receive data, and MARK indicates that the host computer cannot receive data.
			When DTR/DSR control is selected, the printer transmits data after confirming this signal (except when transmitting data by **DLE EOT**, and **GS a**).
			When XON/XOFF control is selected, the printer does not check this signal.
7	SG	---	Signal ground

Serial interface connection example.

```
Host                    Printer
(DTE ex. 8251)

TXD ─────────────── RXD

DSR ─────────────── DTR

CTS ─────────────── RTS

RXD ─────────────── TXD

DTR ─────────────── DSR

FG  ─────────────── FG

SG  ─────────────── SG
```

Note:
Set the handshaking so that the transmitted data can be received.

Transmit data to the printer after turning on the power and initializing the printer.

1.5   Buttons, Switches, and Panel Lights

Power Switch

Type:	Rocker switch
Function:	The power switch turns the power on or off.

Note:
Turn on the power only after connecting the power supply.

Panel Button

FEED button: If you push this button once and release it, the printer feeds paper for one line based on the line spacing set by **ESC 2** and **ESC 3**. If you hold on the button, the printer will feed paper continuously.

Paper feeding using the FEED button cannot be performed when the printer cover is open.

Note:
*The **ESC c 5** command enables or disables the panel button. When the command disabled the button, it will not function.*

Panel lights

POWER:	Green	
	On:	Power is on.
	Off:	Power is not on.
ERROR:	Red	
	On:	Offline (except during paper feeding using the FEED button and the error state)
	Off:	Normal condition.
	Blinking:	Error
PAPER:	Red	
	On:	The paper roll near end is detected.
	Off:	Paper is loaded (normal condition)
	Blinking	Self-test standby state
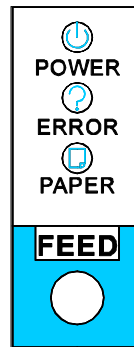
Figure 1-4 Panel button and indicators

Note:

*The panel lights can tell you a lot of information about the situation of the printer, please refer to **Appendix C** for details.*

DIP Switches

Serial interface model

The DIP switches are located at the bottom of the case.
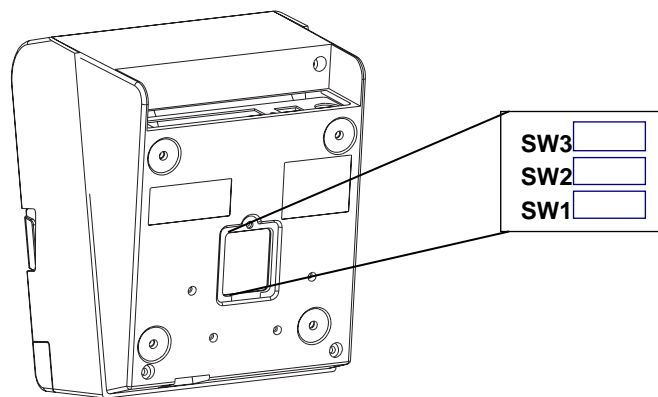
Figure 1-5 DIP switches

DIP switch 1

DIP switch	Function	ON	OFF
1-1	Print emulation	TM200(default)	EPSON Emulation
1-2	Paper near end sensor	Vertical	Horizontal(default)
1-3	Selects print density	Refer to the table as below	
1-4			
1-5	Cutter setting	Disable	Enable(default)
1-6	Stop bit	Fixed to OFF (1 bit)	
1-7	Cutter mode	Full	Partial(default)
1-8	Reserved: do not change settings	Fixed to OFF	

> ### Note:
> *TM200 accept ESC/POS command. Dip 1-1 for different printing format, ON(TM200) for 48 characters per line, OFF(EPSON Emulation) for 42 Characters per line.*

Print Density Selection

Print Density	SW 1-3	SW 1-4
1 Low power consumption mode	ON	ON
2 (Normal)	OFF(default)	OFF(default)
3	ON	OFF
4 (Dark)	OFF	ON

DIP switch 2

DIP switch	Function	ON	OFF
2-1	Reserved	Reserved	
2-2	Receive buffer capacity	2K bytes	96K bytes(default)
2-3	Handshaking	Fixed to OFF	
2-4	Data word length	Fixed to OFF (8 bits)	
2-5	Parity check	Fixed to OFF (None)	
2-6	Parity selection	Even	Odd(default)
2-7	Transmission speed (See the table below)		
2-8			

Transmission Speed

Transmission Speed (BPS) – bits per second	SW 2-7	SW 2-8
4800	OFF	ON
9600	ON	OFF
19200	OFF(default)	OFF(default)
38400	ON	ON

DIP switch 3

DIP switch	Function	ON	OFF
3-1	Buzzer1 setting	Disable	Enable(default)
3-2	Buzzer 2 setting	Disable	Enable(default)
3-3 ~ 3-8	Undefined	-	-

Note:
In order to connect Serial port, the host setting should be set as:

Data bits	8 bits
Parity check	None
Stop bits	1 bit
Flow control (suggest to set for None)	None

Parallel interface model

DIP switch 1

DIP switch	Function	ON	OFF
1-1	Print emulation	TM200(default)	EPSON Emulation
1-2	Paper near end sensor	Vertical	Horizontal(default)
1-3	Selects print density	Refer to page as below	
1-4			
1-5	Cutter setting	Disable	Enable(default)
1-6	Parallel port supports	EPP	SPP/EPP(default)
1-7	Cutter mode	Full	Partial(default)
1-8	Reserved: do not change settings	Fixed to OFF	

Note:
TM200 accept ESC/POS command. Dip 1-1 for different printing format, ON (TM200) for 48 characters per line, OFF (EPSON Emulation) for 42 Characters per line.

Print Density Selection

Print Density	SW 1-3	SW 1-4
1 Low power consumption mode	ON	ON
2 (Normal)	OFF(default)	OFF(default)
3	ON	OFF
4 (Dark)	OFF	ON

DIP switch 2

DIP switch	Function	ON	OFF
2-1	Auto line feed	Always enabled	Always disabled(default)
2-2	Receive buffer capacity	2K bytes	96K bytes(default)
2-3 ~ 2-8	Undefined	-	-

DIP switch 3

DIP switch	Function	ON	OFF
3-1	Buzzer1 setting	Disable	Enable(default)
3-2	Buzzer 2 setting	Disable	Enable(default)
3-3 ~ 3-8	Undefined	-	-

1.6   Self-test

The printer has a self-test function that checks the following:

- ❑   Control circuit functions

- ❑   Printer mechanisms

- ❑   Print quality

- ❑   Control software version

- ❑   DIP switch settings.

> *NOTE:*
> *This test is independent of any other equipment or software.*

Running the self test

1.   Make sure the printer is turned off and the printer cover is closed properly.

2.   Make sure a paper roll has been installed properly.

3.   While holding down the FEED button, turn on the printer using the switch on the front of the printer to begin the self test.   The self test prints the printer settings, and then prints the following, cuts the paper, and pauses.

If you want to continue SELF-TEST
Please press the FEED button

4.   Press the FEED button to continue printing.   The printer prints a pattern using the built-in character set.

5.   The self test automatically ends and cuts the paper after printing the following.

***   completed   ***
Please re-start to exit SELF-TEST

1.7   Hexadecimal Dump

Hexadecimal Dump Function

This function prints the data transmitted from the host computer in hexadecimal numbers and in their corresponding characters.

Performing a Hexadecimal Dump

To use the hex dump feature, follow these steps:

1. After you make sure that the printer is off, open the cover.

2. Hold down the FEED button while you turn on the printer.

3. Close the cover.

4. Run any software program that sends data to the printer. The printer prints "Hexadecimal Dump" and then all the codes it receives in a two-column format. The first column contains the hexadecimal codes and the second column gives the ASCII characters that correspond to the codes.

   Hexadecimal Dump
   1B 21 00 1B 26 02 40 40   ← !   ← & ☻ @ @
   1B 25 01 1B 63 34 00 1B   ←%☺← c   4   ←
   41 42 43 44 45 43 47 48   ABCDEFGH

5. Close the cover and turn off the printer or reset it to turn off the hex dump mode. (or to terminate hex dump, press FEED button three times, and when you see

   *** completed ***
   the hex dump mode was turned off.

   Note:
   Insufficient print data to fill the last line can be printed by setting the printer offline.

Ending hexadecimal dumping

Hexadecimal dumping ends by turning the power off or resetting the printer via the interface after printing has finished.

1.8　Paper Sensors

The printer has 2 paper sensors as follows:

Paper roll near-end sensor

>The sensor detects a near-end of a paper roll.
>When the paper roll diameter becomes sufficiently small, the sensor detects a near-end of the paper roll and the PAPER indicator lights on.

Paper roll end sensor

>This sensor detects whether paper is present or not.
>When the sensor detects a paper-end, the printer stops printing.

>### *Note:*
>*After installing new paper roll, close the printer cover; then the printer restarts printing.*

Cover Open Button

When the cover open button (located to the right of the cover) is pressed, the printer cover is opened. When the cover is closed, the cover open button is latched.

>### *Note:*
>*Be sure to use the cover open button to open the printer cover.*
>*Do not open the cover during printing.*
>*Do not open the cover during the autocutter is operating; otherwise the mechanism may be damaged.*

Cover Open Sensor

The cover open sensor monitors the printer cover. When the sensor detects a cover open during printing, the **ERROR** light blinks and the printer stops printing. The printer recovers when the cover is closed.
When the sensor detects a cover open while the printer is in the standby status, the printer goes offline. The printer recovers when the cover is closed.

>### *Note:*
>*Whether the cover is open or not does not affect the status reported by the paper roll end sensor.*

1.9　Standard Accessories

- ❑　　　Sample paper roll x 1 roll

- ❑　　　User's Manual

- ❑　　　Exclusive external power supply unit and power cord

- ❑　　　Disc x 1

- ❑　　　Communication printer cable

1.10 Options

❑ Standard cable cover set (included wall mounting bracket)

❑ Top waterproof cover

1.11 Consumables

Specified paper

Specified paper	Roll paper: NTP080-80
	Original paper: TF50KS-E Nippon Paper Industries Co., Ltd.
Packaged roll paper	Original paper: PD160R Oji Paper Mfg. Co. Ltd.
	In Japan: Nakagawa, Seisakujo
	In North America: Nakagawa Mfg. (USA) Inc.
	In Europe: Nakagawa Mfg. (Europe) GmbH
	In Southeast Asia: N.A.K. Mfg. (Malaysia) SDN BHD

Note:
The following paper can be used instead of the specified paper above.

Original paper:	AF50KS-E Jujo Thermal Oy (Finland)
	P350 (F380), P310 Kanzaki Specialty Papers, Inc. (U.S.A.)
	PD190R Oji Paper Mfg. Co. Ltd.

Note:
Do not use any paper other than these specified above. Otherwise, print head reliability and print quality are affected adversely.

1.12 External Power Supply Specifications

Input specifications

Rated input voltage	90 to 264 VAC
Rated frequency	50/60 Hz ± 3
Hz Rated input current	Less than 100 V
A Power switch	None
Power LED	None

Output specifications

Output voltage	24 VDC ± 5%
Rated output current	2.5 A
Rated output power	Approximately 60 W
Output peak current	4.5 A (within 300 ms duty 1/6)

2 Mechanisms and Operation

2.1 Component Connections

This printer is made up of the following major components:

❑ TM200 printer mechanism (switch circuit board assembly)

❑ I/F circuit board assembly

❑ Main circuit board unit

2.2 TM200 Printer Mechanism

This printer consists of three mechanisms: a printer mechanism and a cutter module. The following illustration shows the external configuration of the TM200.
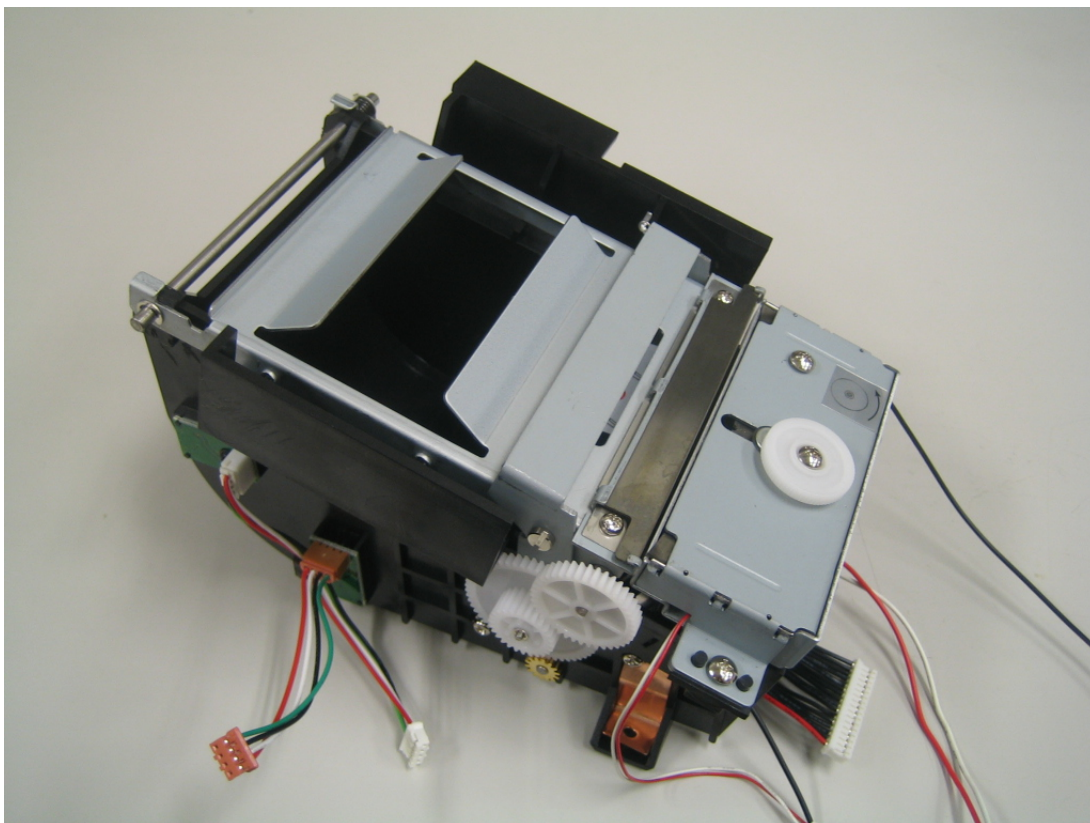
Figure 2.1 TM200 external configuration

Printer Mechanism
Thermal head Module

The thermal head is designed so its heating element is positioned where it comes into contact with the platen. The roll paper wrapped around the platen is kept in contact with the thermal head's heating element at a prescribed pressure, and printing is performed when heat is generated by the heating element.

Printing is performed according to the following steps:

1. The print signal sends a prescribed energizing pulse to the electrodes that correspond to each dot to be printed.

2. Resistors at each electrode generate heat.

3. The heat energy generated by the resistors is transmitted to the roll paper surface through the protective layer to the paper's heat-sensitive layer, causing coloration of the paper.
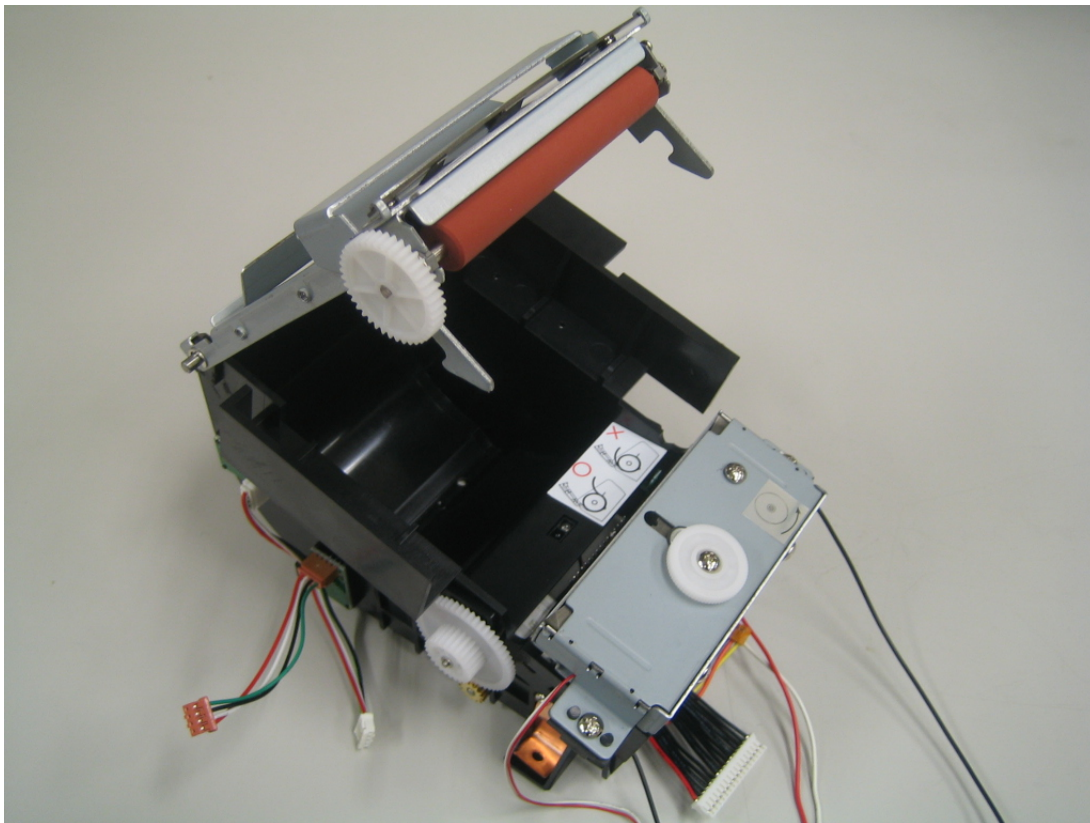
Figure 2.2 Frame cover open

The paper outlet of the printer is covered, and even if paper output becomes blocked for some reason, there is enough room in the space between the platen and frame cover for accumulation of two or three normal length receipts (the length of one sheet is assumed to be 80mm or less). This reduces the chance of receipt paper becoming bent and of the print pitch becoming uneven. Paper that accumulates can be easily pulled out of the printer after the paper outlet is opened.

Autocutter Module

This printer is equipped with an autocutter module for cutting of the roll paper and a manual cutter for manual cutting.

The autocutter has two opposing cutter blades that operate like a scissors to cut the paper. It is a separate cutter blade-type mechanism that does not require passage of the roll paper through an autocutter mechanism slit. Opening the frame cover causes the stationary blade to separate completely from the moving blade. The stationary blade is fixed to the frame cover, while the moving blade is attached to the main frame.

Autocutter operation

The frame cover can be closed while the movable blade is in the home position. Closing the frame cover causes the stationary blade to come into partial contact with the paper cutter frame, and the stationary blade and movable blade are brought into relative position.

Cutter blade knob

The movable blade is in the home position whenever cutter operation is not being performed. In addition to safety considerations, this enables a mechanism in which the frame cover cannot be opened or closed while the movable blade is not in the home position.

2.3 Main Circuit Board Unit

The main circuit board unit is made up of the following electrical circuits:

❏ CPU and CPU peripheral logic circuits
  CPU
  RAM
  ROM
  Gate array
  Reset circuit

❏ TM200 control circuits
  Thermal head drive circuit
  Paper feed motor drive circuit
  Autocutter drive circuit
  Detector circuits

❏ Control panel control circuits

❏ Drawer kick control circuit

❏ Power supply circuits

❏ Filter circuits
  +24V output circuit
  +5V output circuit

CPU peripheral logic circuits

RAM (128K byte)

RAM is used for temporary storage of the following:

❑ Data received from the interface (receive buffer)

❑ Pattern data printed by the print head unit (printer buffer)

❑ Data used for CPU routines (flags, pointers, etc.)

Flash memory (2M or 8M bits)

A printer control program and character generator data is written into flash memory. The control program controls basic printer operations, and all CPU control is performed in accordance with this program. Another flash memory works as a sub-memory for such items as expanding character generator data.

RS-232C interface specifications

Selection between two signals (pin 6 (DSR) or pin 25 (INIT)) is possible.

TM200 Control Circuit

Thermal head driver circuit

The print head of the receipt printer mechanism is a thermal type print head with 576 dots per line. All print head control is performed via a gate array. A driver is built into the print head, and sending of print signal DATA-IN, which is synchronized with the CLOCK signal, to the driver sets the print/non-print status of each dot. Data is confirmed by latch signal #LATCH. Print time control is performed by #STROBE1 and #STROBE2, while energizing time is controlled by the gate array.

Changes in head temperature causes fluctuation of the resistance value of the thermistor built into the head, which is output as temperature signal THERMISTOR.

Paper feed motor driver circuit

The paper feed motor is constant-current driven by a special-purpose IC. The energizing direction switching signals (PH1,PH2,PH3 and PH4) from the CPU. The special-purpose IC controls the paper feed motor in accordance with these signals using Q1, Q2, Q3, and Q4 signals.

Autocutter driver circuit

The autocutter driver use MOSFET to control DC motor.

Detector circuits

Paper end sensor circuit

The thermal printer mechanism is equipped with a paper end sensor, which is connected via switch circuit board assembly to the main circuit board unit. The paper end signal FP_Sensor is input to the DSP's port.

Cover open sensor circuit

The cover open sensor is located next to the thermal printer mechanism, and it is connected via Door Sensor board assembly to the main circuit board unit. Detector signal INPUT_4 is input to the CPU.

Control Panel Control Circuit

This control panel is located on the mainboard. It has three LEDs (POWER, ERROR, PAPER) and one button (FEED). The POWER LED drives when +5V is supplied by the power circuit. The ERROR and PAPER LEDs are controlled by the CPU.

Drawer Kick Control Circuit

When signals KICK_OUT_X1 and KICK_OUT_X2 from CPU go active, it causes transistor array and outputting the drawer drive signal. The OPEN_CLOSE signal, which indicates whether or not the drawer is open, is input to the CPU, and this status can be obtained from the host interface.

Power Supply Circuit

The table as below shows supply voltage values and their applications.

Power supply voltage values and applications

Voltage Value	Main Applications
1.8V	Power supply for the CPU core
3.3V	Power supply for the CPU I/O pins
+5V (VCC)	Logic circuit power supply
	Interface board power supply
	Detector power supply
	Thermal head logic circuit power supply
+24V	Printer mechanism power supply Paper feed motor
	Thermal head
	Autocutter
	Drawer kick driver power supply

+24V Control Circuit

The +24V power supply is split between the printer power supply and +5V. Then split into 3.3V and 1.8V.

+5V Control Circuit

A +5V regulator circuit switches the input +24V power supply and converts it to +5V. The switching regulator IC switches the input +24V, and +5V voltage is output.

The RS-232 power supply is generated by a charge up circuit built into the RS-232 interface's onboard driver.

2.4 I/F Circuit Board

This printer uses a TM series universal interface, which allows support of a variety of different interfaces by changing the interface board.

- ❑ RS-232 Interface
- ❑ IEEE 1284 Interface
- ❑ USB Interface
- ❑ Multi interface (Parallel and Serial)

2.5 Switch Circuit Board

Switch circuit board has the following built-in electrical circuits:

- ❑ Paper FEED button
- ❑ LED (POWER, ERROR, PAPER)

3 Handling, Maintenance, and Repairs

3.1 Handling

Transport Precautions

Take the following steps to protect the unit against vibration and impact whenever transporting it:

CAUTION:
- We recommend that each unit be packed individually in the boxes supplied by LABAU Technology Corp..

- Remove the paper from the unit.

- Make sure that the paper roll cover is securely closed.

Setup Precautions

> ***Note:***
> The cover of the unit is secured in place with tape. Remove the tape before using the unit.

Operational Precautions

Observing the following operational precautions protects the unit against damage.

CAUTION:
- Connect the interface cable, power cable, and drawer cable to the applicable connectors of the unit. Do not use undue force when plugging cables into connectors.

- Do not turn unit power off during normal operation. Be especially careful to avoid turning power off while a paper cut operation is being performed. Doing so can result in the cutter blade being exposed, which will make it impossible to open the paper roll cover.

- Never pull out paper while the paper roll cover is open.

- During normal operation, never open the cutter cover and rotate the cutter manual knob by hand. Doing so can cause the cutter blade to be exposed, making it impossible to open the paper roll cover.

- The heating element of the printer mechanism's thermal head and the driver IC are easily damaged. Never allow these components to come into contact with metal or other hard objects.

- Never touch the printer mechanism's (thermal head's) heating element with your hand. Doing so can soil the heating element and affect proper operation.

- The head and motor areas are very hot during and immediately after printing. Do not touch components in these areas directly with your hand.

Paper Precautions

CAUTION:

■ Be sure to use only paper that conforms with the specifications in the preceding section of this manual. Thermal paper that includes Na, K, or C1 ions can affect proper operation of the thermal head's heating element.

■ Thermal paper starts to color at around 70°C. Take care to protect unused and printed thermal paper against the effects of heat, light, and humidity, which can cause the paper to color and characters on the paper to fade.

■ Take the paper roll out of the printer when you will not use the printer for a long time in a high temperature and humidity environment.

■ Do not use this unit to print on label paper.

Loading paper roll

Note:
Be sure to use paper rolls that meet the specifications. Do not use paper rolls that have the paper glued to the core because the printer cannot detect the paper end correctly.

1. Make sure that the printer is not receiving data; otherwise, data may be lost.

2. Open the paper roll cover by pressing the cover-open button.
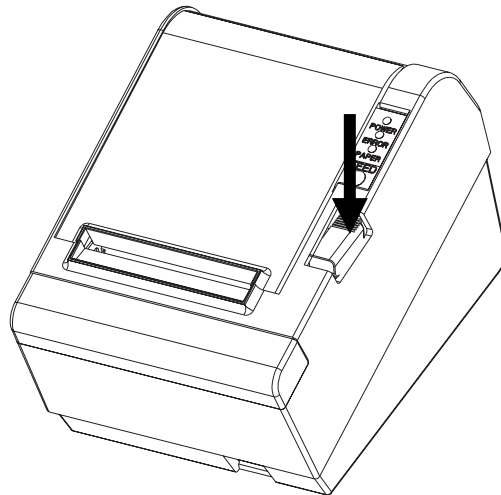
3. Remove the used paper roll core if there is one.

4. Insert the paper roll as shown.
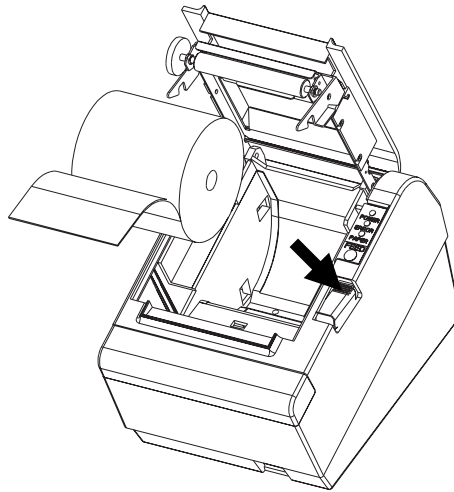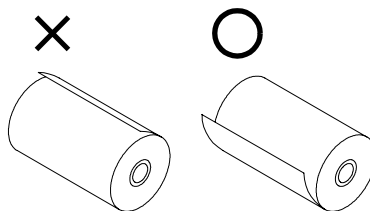
6. Pull out a small amount of paper, as shown. Then close the cover
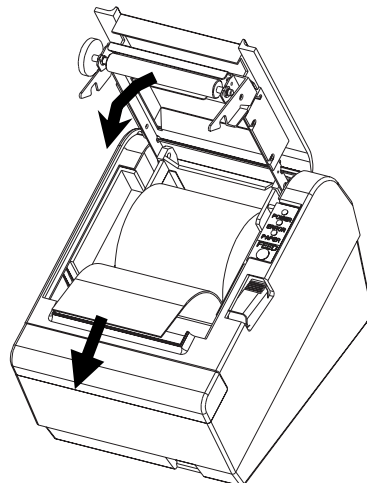
3.2 Problem Solving

Errors

     See Chapter 4, *Error Types and Processing.*

Paper roll cover does not open (paper roll cover button does not work)

1. Turn the printer off and press the cover open button to open the cover.

2. Remove the jammed paper and put the roll back in the printer and close the cover. (Take care not to touch the print head.)

3. If paper is caught in the automatic cutter and the printer cover cannot be opened, open the cutter cover as shown below.

4. Then turn the knob until you see cutter blade back to the lowest position, as shown in the illustration below. This returns the cutter blade to the normal position.   Also notice that there is a label near the cutter to assist you.

When paper jams, turn the knob until the cutter blade back to lower position.
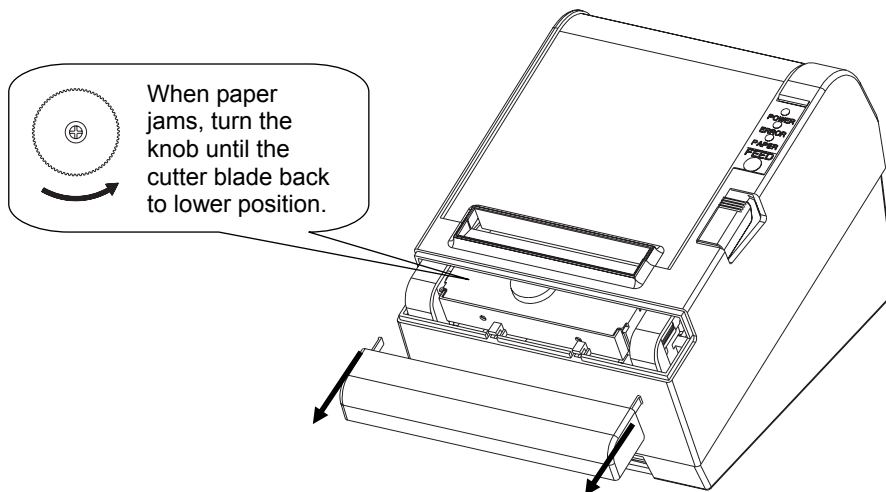
5. Close the cutter cover.

6. Open the printer cover.

7. Remove the jammed paper.

     Note:
     Other than a paper jam, the autocutter locking up could have been caused by a foreign object such as a push pin or paper clip. If this is the case, follow the same procedure described above to return the cutter to its normal position.

     Do not open the cutter cover unless you find that the paper roll cover does not open.

3.3 Clearing Paper Jams

CAUTION:

Take care not to let metal objects come into contact with the thermal head. Metal can damage the head.

Do not touch the thermal head or radiation plate. Printing can cause them to become very hot.

1. Open the paper roll cover.

   Note:
   See the previous section for steps to take if the paper roll cover does not open.

2. Next, turn power off.

3. Grasp the leading end of the receipt paper and pull the jammed paper.

   Note:
   Be sure to remove all of the paper. Leaving part of the paper in the unit can cause the sensor to malfunction.

4. Correct the problem that caused the paper jam and reload the paper roll into the unit.

   Note:
   See the section "Loading paper roll" for details on how to load paper roll.

3.4 Inspection and Maintenance

Proper performance of the inspection and maintenance procedures described below makes it possible for this unit to perform for the years of trouble-free operation for which it is designed.

Maintenance Procedures

The inspection procedures described here are divided between two types: daily inspection, which can be performed by the individuals who use the unit on a daily basis, and periodic inspection, which should be performed by individuals who have a more detailed technical knowledge of the unit.

	Inspection item	Action
Setup	Check for proper connection of cables. Check for proper installation of paper roll. Make sure the paper roll cover and cutter cover are closed.	Reconnect any cables that have come loose. Correctly install paper roll. Close all covers.
Paper particles, paper scraps, foreign matter	Open the paper roll cover and make sure there are no large pieces of paper or other foreign matter present.	Clean out any paper or foreign matter.
Dirt, lint, and dust inside components	Check for dirt, lint, and dust in the paper path. Check for any foreign matter on the surface of or in the paper end sensor. Check if the platen roller has become white with paper particles.	Use a vacuum cleaner to completely remove all dirt, lint, and dust. Wipe away foreign matter with paper or some other soft material. Wipe off the roller with a cotton swab moistened with water.
Springs	Check the frame shutter spring and all other springs for deformation and disconnection.	If you discover a problem, correctly install the spring or replace it with a new one.
Operation	Check for abnormal noise during operation and any abnormal printing.	Correct any problems in accordance with the Troubleshooting Guide in Chapter 4.

Cleaning

Thermal head

Caution:

■ Turn off the printer power before cleaning.

■ Note that the thermal head (thermal element and radiation plate) becomes very hot during normal operation, creating the danger of burn injury. Be sure to wait for about 10 minutes after turning printer power off before beginning the cleaning.

1. Open the paper roll cover.

2. Clean the thermal element (the area that looks like it is marked with a thin black line) of the thermal head with a cotton swab moistened with an alcohol solvent (ethanol, methanol, or IPA).

Radiation plate

Head   Thermal element
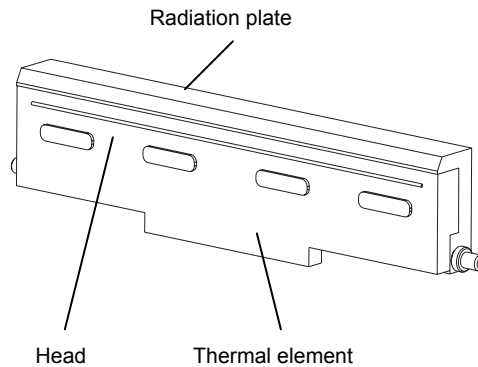
Caution:

Never touch the thermal element with your hand. Doing so can damage the thermal element.

3. After confirming that the alcohol solvent has dried up completely, close the paper roll cover.

Platen roller on receipt side

Wipe the platen roller surface with a cotton swab moistened with a little water while rotating the platen roller gear.

Paper roll end sensor on receipt side

Clean the paper roll end sensor with a cotton swab moistened with a little water.

Exterior dirt

Use a clean, dry cloth to wipe off dirt from the exterior of the unit. If this does not get the unit clean, wipe with a cloth moistened with a small amount of water or a solution of water and a mild neutral detergent.

Caution:

Do not use alcohol, benzene, thinner, trychloroethylene, ketone or other similar agents for cleaning. Such agents can cause deformation, deterioration, and damage to plastic and rubber components.

Dirt, lint, dust

Use a vacuum cleaner to completely remove all dirt, lint, and dust.

4 Troubleshooting

4.1 Symptoms and Solutions

This explains how to find the source of a problem using the symptom. The numbers in the "Checkpoints" column indicate the order to use to check the problem. If you cannot determine the cause of the problem after checking the first item, proceed to the next number.

Table 4-1 Symptoms and checkpoints

Symptom		Checkpoints (by Priority)
Power does not turn on. Power on self check is not completed Or, POWER LED does not light.		1. Check the power supply unit. Check that 24V is coming out of the power supply 2. Check the main circuit board unit. 3. Unplug the printer. Then unplug each motor or coil's connector from the main board one by one; plug the printer back in, and power it on. This will let you know if any motor or coil has burned out and is pulling down the power. 4. Replace the I/F circuit board.
There are missing dots in the print	Receipt printing	1. Clean the thermal print head. (See page 30) 2. Replace the thermal print head module. (See page 44) 3. Replace the main circuit board unit. (See page 47)
The print is thin.	Receipt printing	1. Clean the thermal print head. (See page 30) 2. Adjust DIP switches DSW 1-3 and 1-4 (print density selection switches). (See page 12) 3. Replace the thermal print head module. (See page 44) 4. Replace the main circuit board unit. (See page 47)
Unevenness occurs in the concentration of the print.	Receipt printing	1. Clean the thermal print head. (See page 30) 2. Replace the thermal print head module. (See page 44) 3. Replace the main circuit board. (See page 47)
Paper feed failure.	Thermal printer	1. Check that the roll paper is properly loaded. 2. Check the receipt paper feed motor. 3. Replace the main circuit board. (See page 44)
Paper jams		Remove the jammed paper by following the directions in "Clearing Paper Jams."
Missing characters/misprinted characters/font breakdown.		1. Check the DIP switch settings. 2. Replace the interface cable. (See page 47)
ERROR LED is lit.		1. Close the cover. 2. Install a new paper roll.

4.2 Error Types and Processing

Printer Operation when an Error Occurs

The printer executes the following operations upon detecting an error.

❑ Stops all printer operations.

❑ Flashes the ERROR LED.

Data Receive Error (only with the serial interface model)

If one of the following errors occurs during serial interface communications, the printer ignores the data

❑ Parity error

❑ Framing error

❑ Overrun error

Locations of the Main Elements on the Main Circuit Board Unit

The following shows the locations of the main elements on the main circuit board unit.

CPU (U1)

ROM (U10, Low byte)

ROM (U12, High byte)

Autocutter drive (J5~J8)

Paper feed motor driver (U31)

Thermal Head power MOS (Q14, Q15)
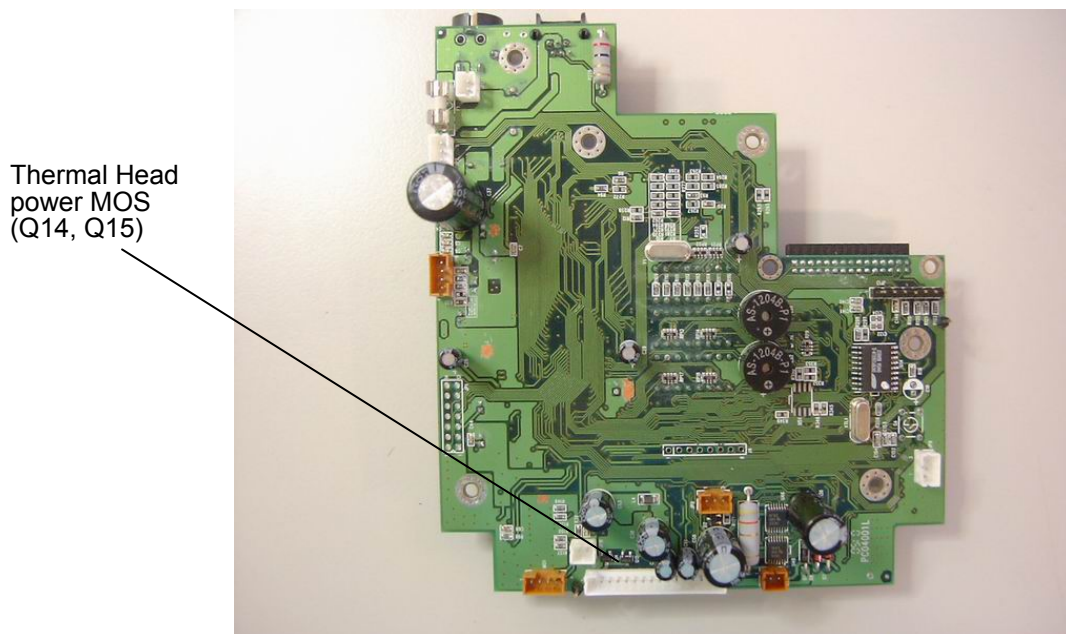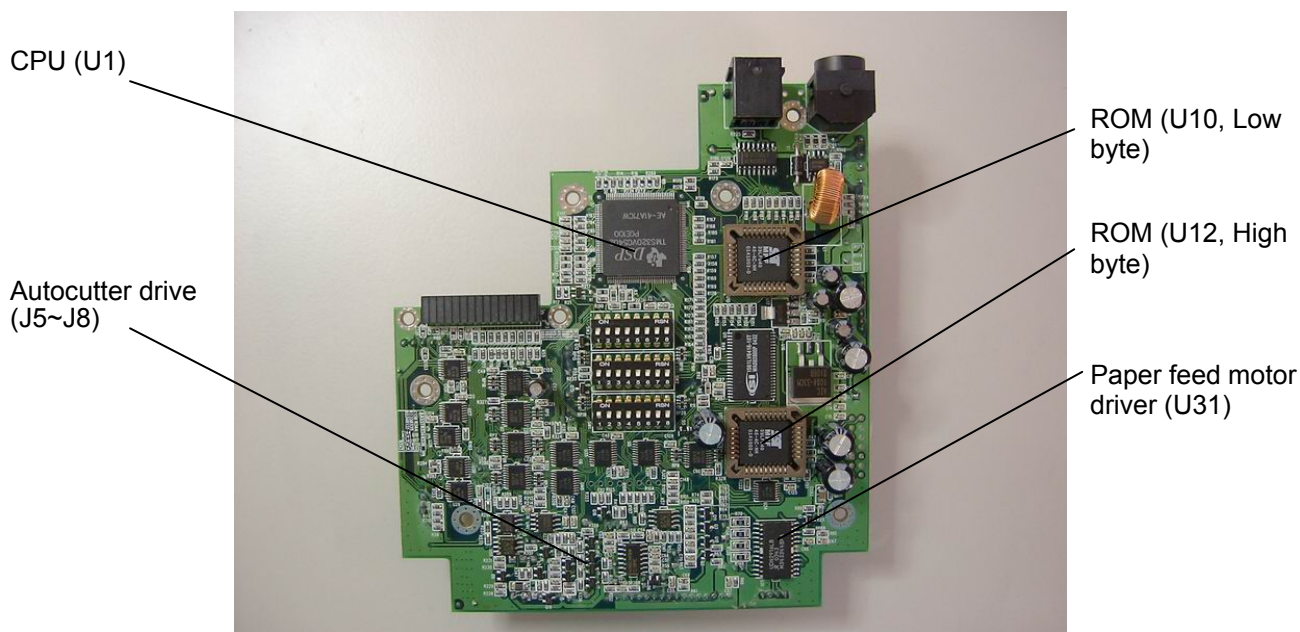
5 *Disassembly, Assembly, and Adjustment*

5.1 Before Starting disassembly, assembly, and adjustment

Be sure to observe the following important points whenever performing disassembly, assembly, or adjustment.

Caution:

■ Disconnect the power supply unit from the printer before beginning work. Current continues to flow through internal circuitry even when the printer's power switch is turned off. Performing work without disconnecting the power supply can cause serious damage to the printer.

■ Disconnect all peripherals connected to the printer before beginning work.

■ Perform all disassembly in accordance with the procedures in this manual. Incorrect disassembly can cause serious damage to the printer.

■ Never touch an FPC or its connectors with your fingers. Getting dirt on the FPC or its connectors can result in improper connection.

5.2 Using this Manual

This section explains a number of general conventions used in this manual.

Titles

The titles that appear inside the sections of this manual describe the assembly and disassembly of major parts and blocks. Not all of the parts (service parts) are indicated as titles.

Disassembly, Assembly, and Adjustment Procedures

The procedures in this manual are arranged so the entire printer is disassembled when performed from beginning to end.

Disassembly of some parts and blocks may be impossible unless performed in accordance with the procedures described in this manual.

Perform the procedures in this manual in reverse to assemble the printer.

5.3 TM200 Disassembly, Assembly, and Adjustment
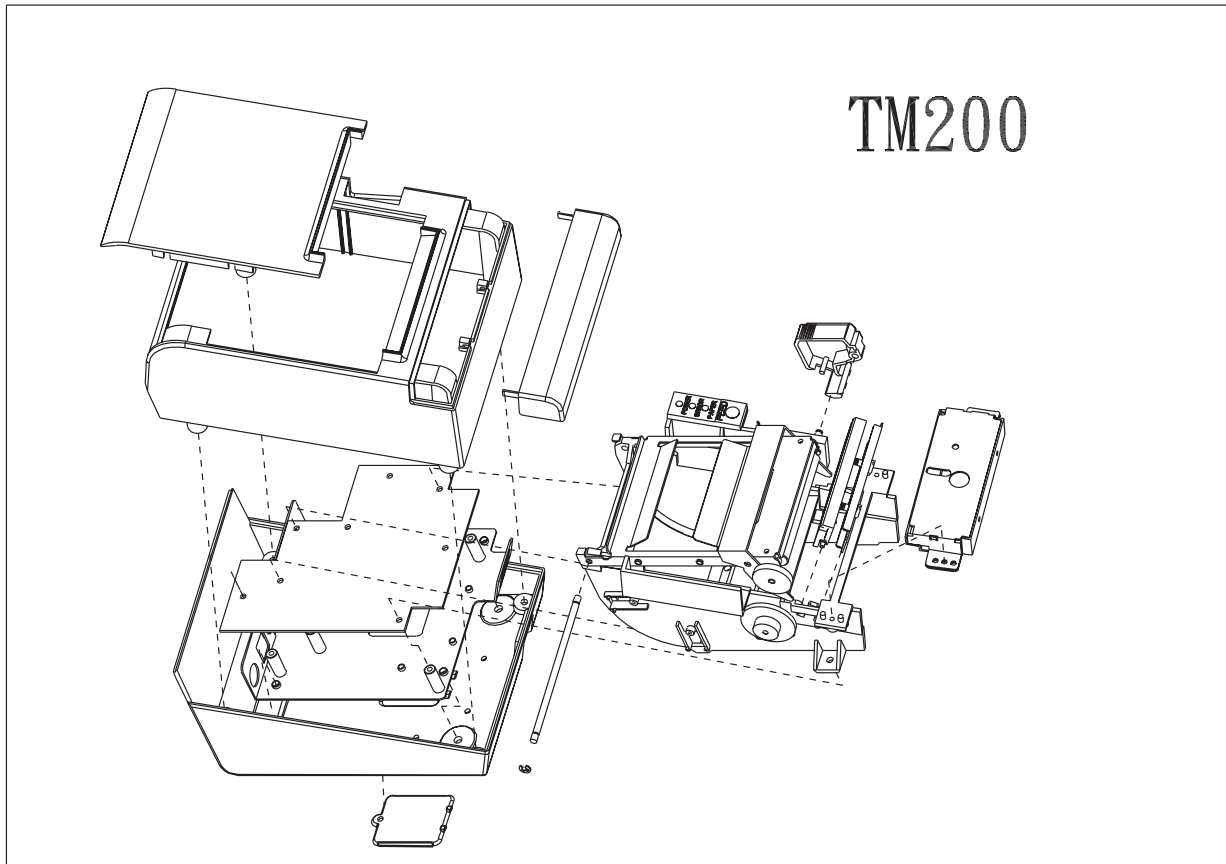
There are 5 block of TM200 showing as following,

- ❑ Door sensor block

- ❑ Paper out sensor block and paper sensor block

- ❑ Autocutter module

- ❑ Thermal head module

- ❑ Main circuit board
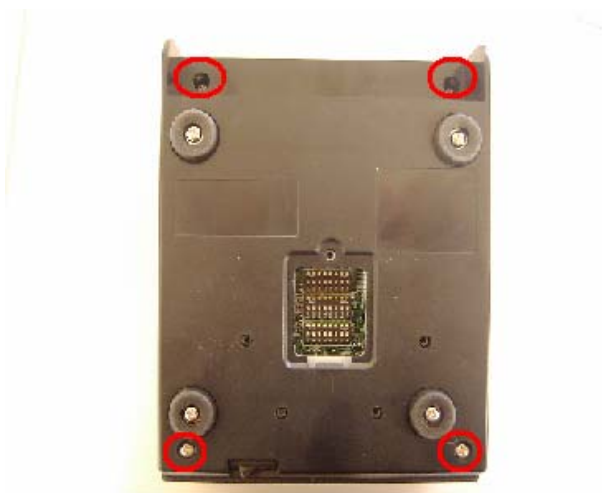
Please following the steps for disassembly,

Door sensor block

1. Loose 4 screws beside the thermal cover and move them.

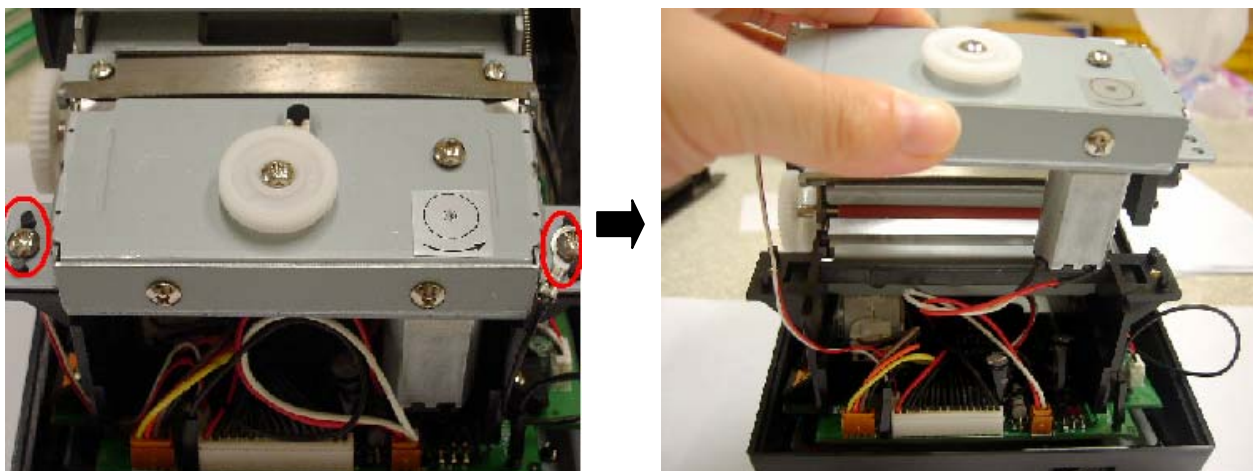2. Screwing 4 screws (the place indicated by the red circle on the photo) on the bottom of the unit.

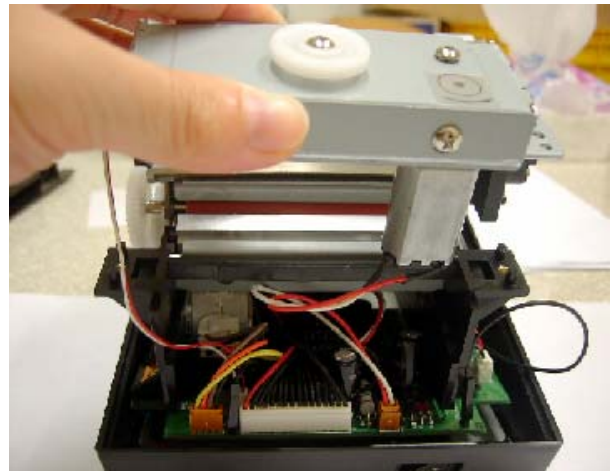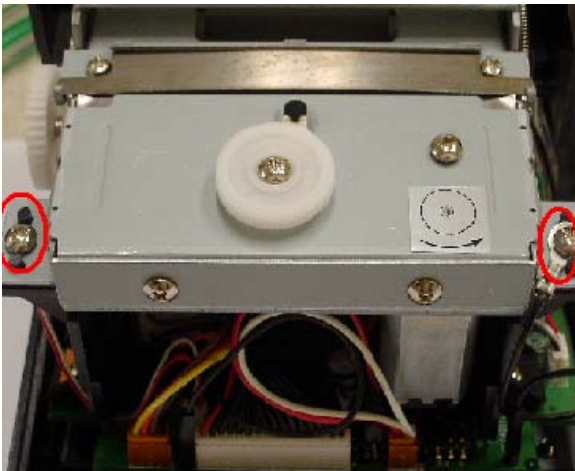3. Reverse the printer, move the body cover apart.
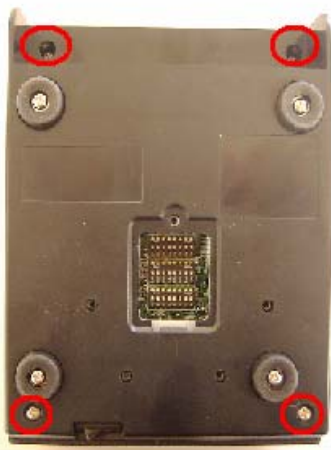
Note:
You may use your thumb push down the lever while the other fingers forcing up the body cover.

4. Open the up cover.

5. Move the 2 screws are circled indicated on the photo.
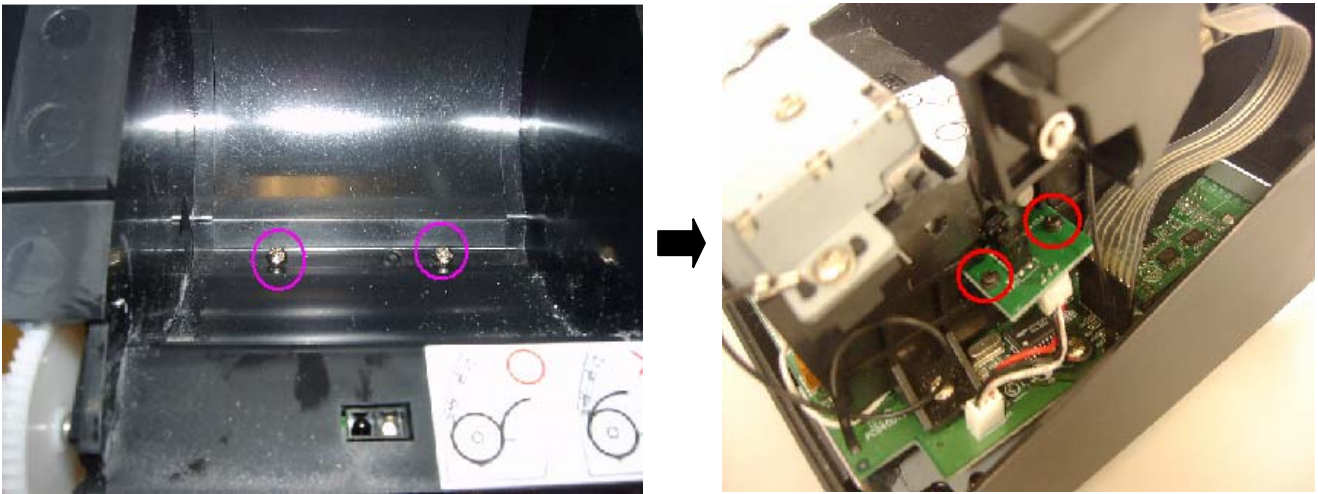
To install, reverse the removal procedures.

Paper out sensor block and paper sensor block:

1. Loose 4 screws beside the thermal cover and move them.

2. Screwing 4 screws (the place indicated by the red circle on the photo) on the bottom of the unit.
3. Reverse the printer, take the body cover apart.

Note:
You may use your thumb push down the lever while the other fingers forcing up the body cover.

4. Remove the screws on the bottom of the printer mechanism.

5. Remove 2 screws circled on the photo and all the connections between printer mechanism and main circuit board. Then, you can depart printer mechanism from its main board.
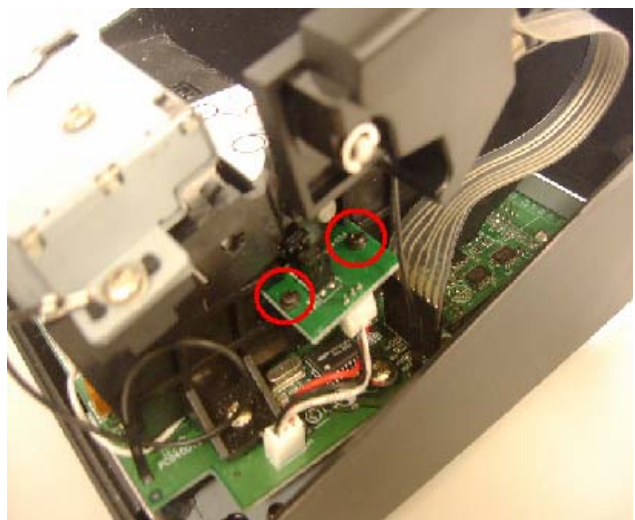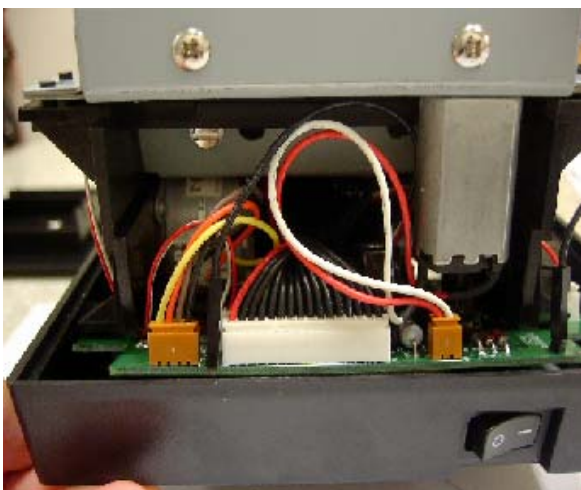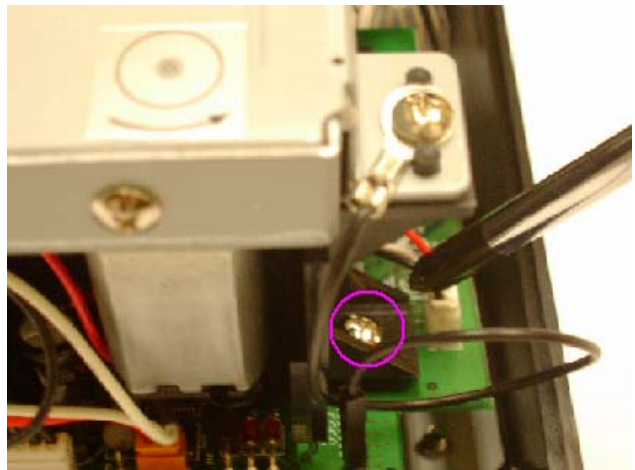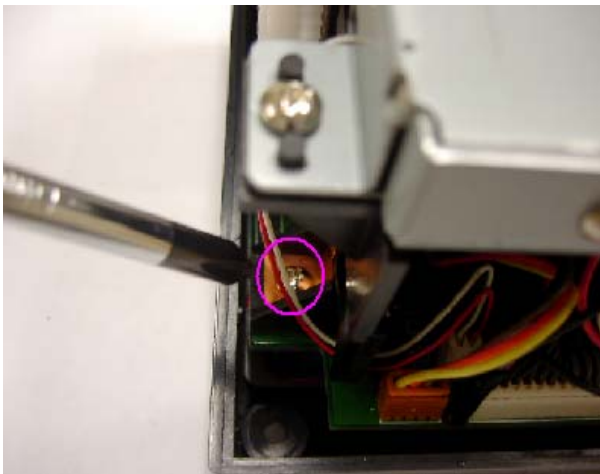
6. Paper sensor connecter beside the printer mechanism as the photo.
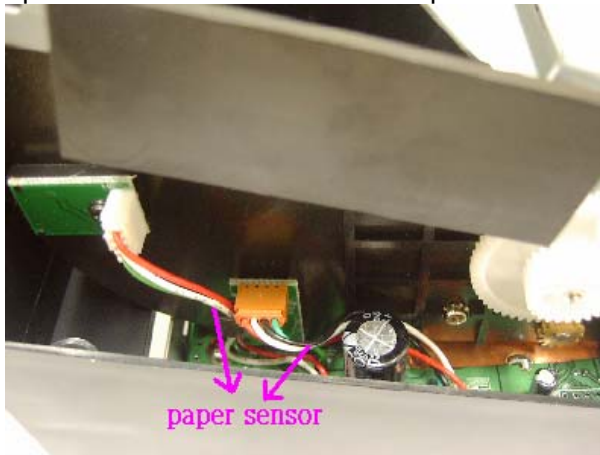
7. Remove the screw on the bottom of the printer mechanism as circled on photo, the paper out sensor could be moved then.
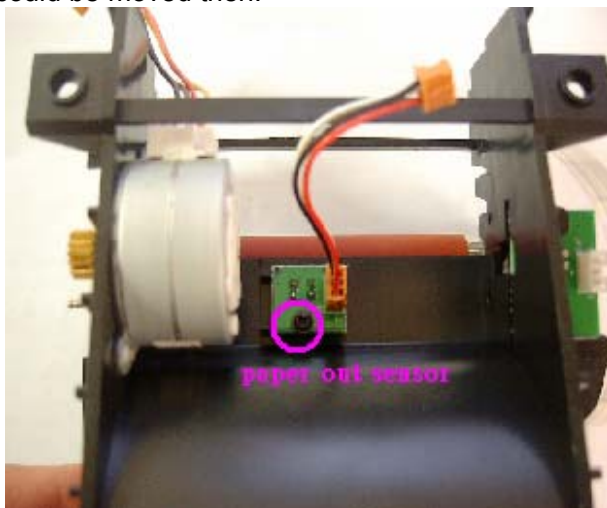
To install, reverse the removal procedure.

Autocutter module:

1. Loose 4 screws beside the thermal cover and move them.

2. Screwing 4 screws (the place indicated by the red circle on the photo) on the bottom of the unit.
3. Reverse the printer, take the body cover apart.

Note:
You may use your thumb push down the lever while the other fingers forcing up the body cover.

4. Remove the 2 screws beside the autocutter and the connections from circuit board.

To install, reverse the removal procedure.

CAUTION :

When you installed the autocutter module, you must follow the steps below. If you do not follow them, it could cause an autocutter operation failure.

(1) Secure the right side screw.

(2) Secure the left side screw.

Thermal head module

1. Loose 4 screws beside the thermal cover and move them.

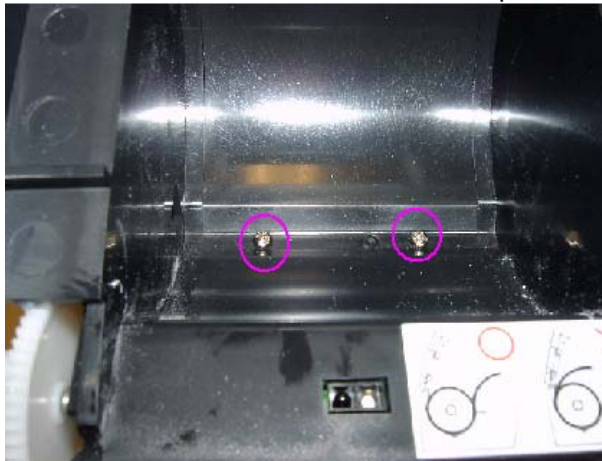2. Screwing 4 screws (the place indicated by the red circle on the photo) on the bottom of the unit.
3. Reverse the printer, take the body cover apart.

Note:
You may use your thumb push down the lever while the other fingers forcing up the body cover.

4. Remove the 2 screws beside the autocutter and the connections from circuit board.

5. Stretch your forefinger to the bottom of the thermal head module and force up to depart it from the printer mechanism.
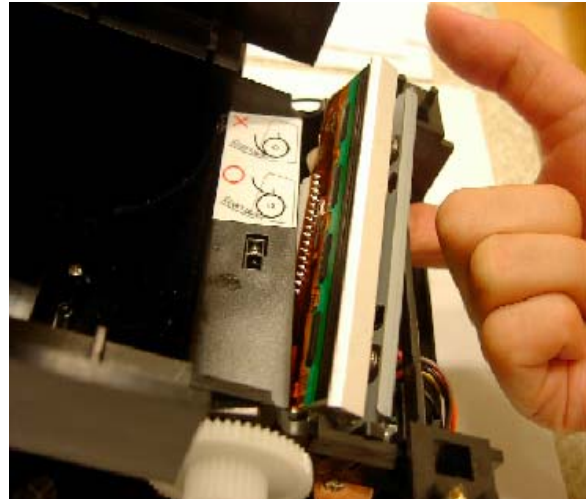
6. Remove the connections from circuit board.

To install, reverse the removal procedure.

CAUTION:

Note that the (thermal head) becomes very hot during normal operation, creating the danger of burn injury. Be sure to wait for about 10 minutes after turning printer power off before beginning the procedures.

When performing procedures, be sure to use a grounded wrist band or take other measures to protect against electrostatic charge. Failure to do so can result in damage to the (thermal head).

Never touch the thermal element (the area that looks like it is marked with a thin black line) of the (thermal head) with your hand. Doing so can damage the heating element.

Whenever there is dirt or any other foreign matter on the (thermal head), clean it off with a cotton swab moistened with alcohol.

When you installed the autocutter module, you must follow the steps below. If you do not follow them, it could cause an autocutter operation failure.

(1)   Secure the right side screw.
(2)   Secure the left side screw.

Main circuit board

1. Loose 4 screws beside the thermal cover and move them.

2. Screwing 4 screws (the place indicated by the red circle on the photo) on the bottom of the unit.
3. Reverse the printer, take the body cover apart.

Note:
**You may use your thumb push down the lever while the other fingers forcing up the body cover.**

4. Remove the screws on the bottom of the printer mechanism.

5. Remove 2 screws circled on the photo and all the connections between printer mechanism and main circuit board. Then, you can depart printer mechanism from its main board.
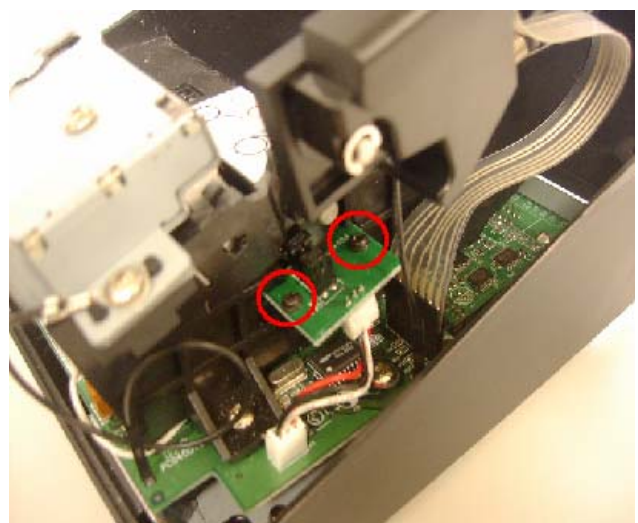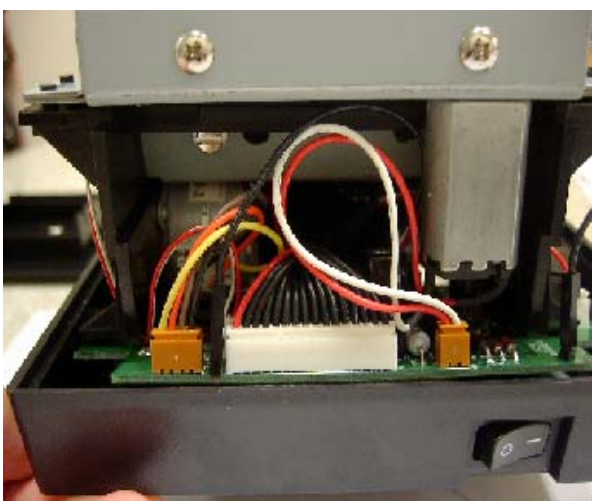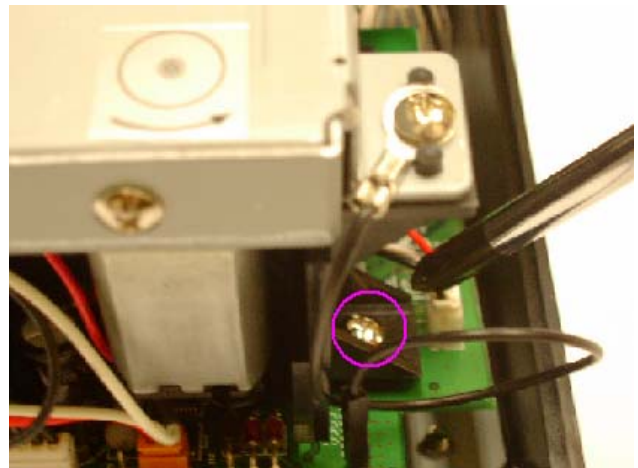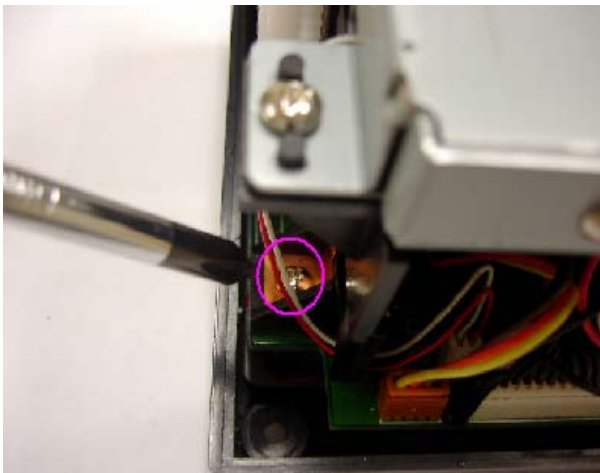
6. Remove the two screws on the circuit board, you could depart it then.

7. Reverse the board, you could find the ROMs.
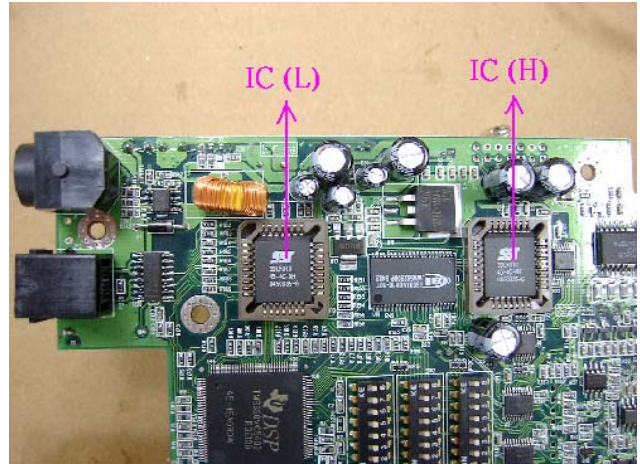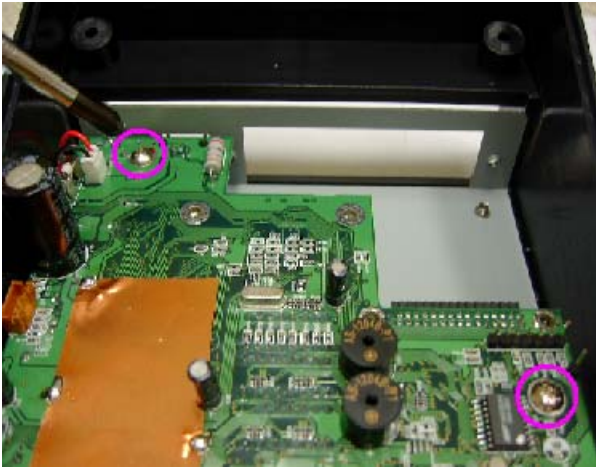
To install, reverse the removal procedures.

Caution:

When performing this procedures, be sure to use a grounded wrist band and take other measures to protect against electrostatic charge.

Internal circuit board components become hot during normal use. Make sure they have cooled sufficiently before performing this procedure.

There are 2 ROMs on the board, the one is LOW bye(U10), the other one is HIGH byte(U12), please make sure the ROM be placed to the correct place.

After removing these circuit boards, be sure to protect them against electrostatic charge damage by placing them in an anti-static bag.

Appendix A Interface

IEEE 1284 Bidirectional Parallel Interface

Specifications

Data transmission:	8-bit Parallel
Synchronization:	Externally supplied P-/STROBE signals
Handshaking:	P-/Ack and P-BUSY signals
Signal levels:	TTL compatible

Reverse communication (Printer Host): Nibble or Byte Mode

Switching between online and offline

The printer is not equipped with any online/offline switch.   The printer is placed into offline status in either of the followings:

1. When the power is turned on or until the printer becomes ready for data transmission after it is initialized by the reset signal from the interface.

2. During the self-test.

3. When the cover is open.

4. During paper feeding using the paper feed button.

5. When the printer stops printing due to a paper-end (in cases when empty paper supply is detected by either the paper roll end detector or the paper roll near-end detector with a printing halt due to paper shortage enabled by **ESC c 4**).

6. During macro executing standby status.

7. When a temporary abnormality occurs in the power supply voltage.

8. When an error has occurred.

Interface Pin Assignments

Pin	Pin Name	Pin Description and Function
1	P-/STROBE	Data Strobe
2	PRINTER_D0	Data Bit 0
3	PRINTER_D1	Data Bit 1
4	PRINTER_D2	Data Bit 2
5	PRINTER_D3	Data Bit 3
6	PRINTER_D4	Data Bit 4
7	PRINTER_D5	Data Bit 5
8	PRINTER_D6	Data Bit 6
9	PRINTER_D7	Data Bit 7
10	P-/ACK	Acknowledge receipt of Data
11	P-BUSY	Strobe received, Waiting on Acknowledge
12	P-PE	Paper Out / Paper Error
13	P-SELECT	Daisy-Chain Device Select Signal
14	P-/AF	Auto-Feed paper
15	NC[*]	
16	GND	GND
17	GND	GND
18	NC	
19~30	GND	GND
31	P-/INIT	Cancel Current Job (May be called /PRIME)
32	P-/ERROR	
33	GND	
36	P-/SEL IN	Select In; Taking low or high sets printer on line or off line
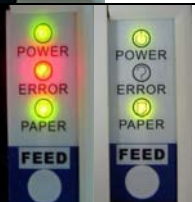
* NC: Not Connected

Appendix B Exploded diagram

TM200
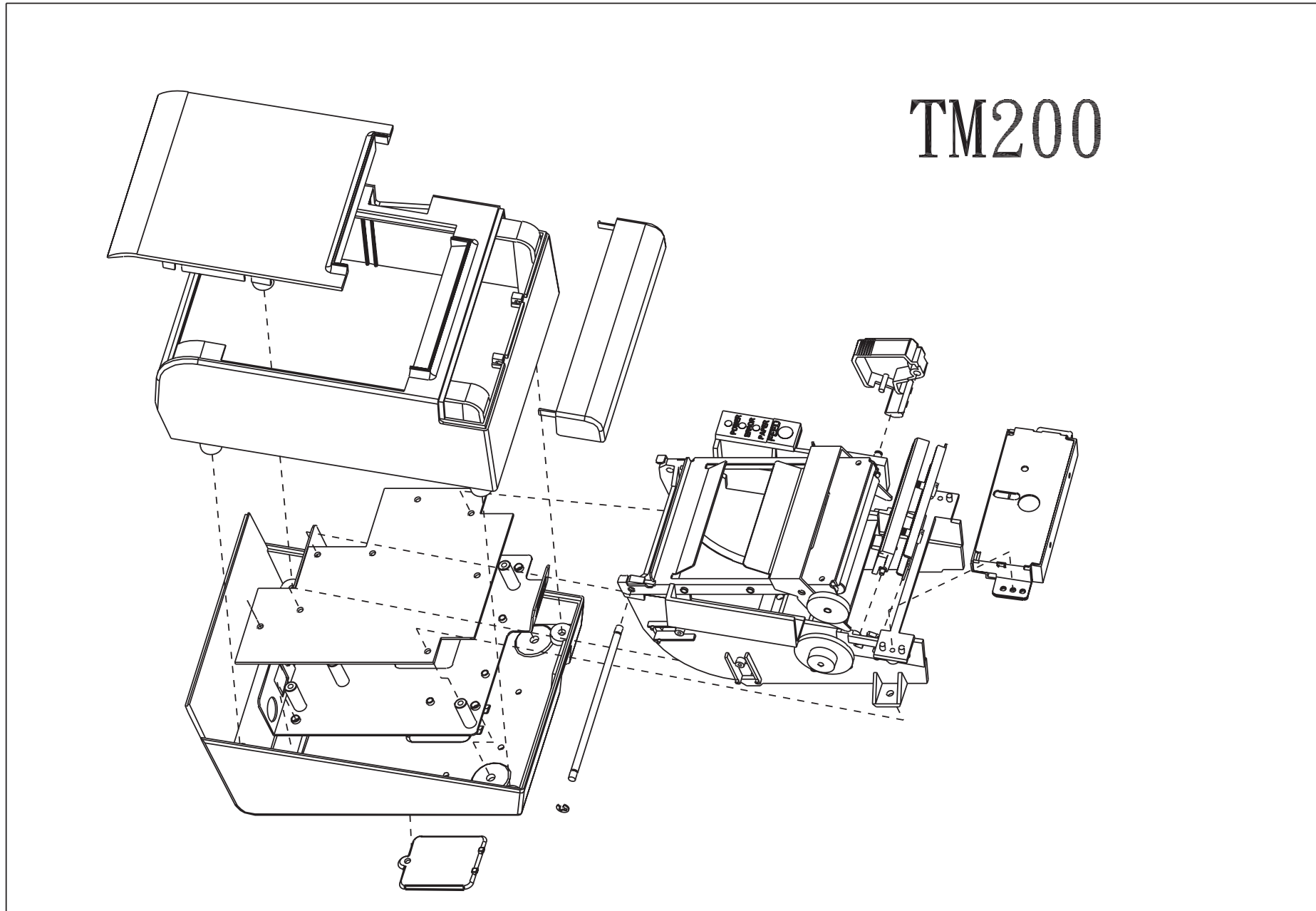
Appendix C Panel lights and indicators

Indication	LED light	Panel status
Normal operation status	● Power - Green ● Error - OFF ● Paper - Green	
Upper cover is open	● Power - Green ● Error - Red light blinking ● Paper - Green	
Paper end, or sensor can't detect paper roll	● Power - Green ● Error - OFF ● Paper - Red and Green light blinking	
Paper near end	● Power - Green ● Error - OFF ● Paper - Red	
Upper cover is open, or sensor cannot detect paper roll	● Power - Green ● Error - Red blinking ● Paper - Red and Green blinking	
Autocutter doesn't work	● Power - Green ● Error - Red ● Paper - Green	
Paper jam	● Power - Green ● Error - Red blinking ● Paper - Green	

Indication	LED lights	Panel status	
Enter ISP mode (DIP switch 1-8 on)	● Power - Green ● Error - OFF ● Paper - OFF		
The printer was ready for receiving data from the host (after press FEED button)	● Power - Green ● Error - Red ● Paper - OFF		
Ready for ISP	● Power - Green ● Error - Red ● Paper - Red		
ISP is finished	● Power - Green light blinking ● Error - Red light blinking ● Paper - Red light blinking		

Appendix D Parts number list

Item	Part Number	Descriptions
1	BK04001M	TM200 Mainboard
2	BK04002D3	Parallel port interface board
3	CB00033A	Parallel printer cable, white color, 36 pin
4	CB00033B	Parallel printer cable, black color, 36 pin
5	BK04009F1	Serial (RS232 32K buffer) port interface board
6	CB04008D	Serial printer cable, white color, 9 to 25 pin
7	CB04008E	Serial printer cable, black color, 9 to 25 pin
8	BK04008C1	USB port interface board
9	CB04011A	USB printer cable, white color,
10	CB04011B	USB printer cable, black color
11	BK04010B3	Multi port(Parallel & RS232) interface board
12	CB04012A	Parallel printer cable, white color, 25 pin
13	CB04012B	Parallel printer cable, black color, 25 pin
14	CB04013A	Serial printer cable, white color, 25 to 25 pin
15	CB04013B	Serial printer cable, black color, 25 to 25 pin
16	BK04201A	Thermal head module
17	BK04208A	Autocutter module
18	BK04006C	Door sensor
19	BK04005B	Paper out sensor
20	BK04004C	Paper sensor (Horizontal)
21	BK04004D	Paper sensor (Vertical)
22	PW00003A	Switching power, without power cord
23	CB00030A	Power cord, 110V, US plug
24	CB00031A	Power cord, 220V, European plug
25	CB00032A	Power cord, 230V, Australia plug